II. REMARKS

Independent claims 12 and 29 have been amended to recite "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range" as supported on page 2, line 35, to page 3, line 7, of Applicants' specification as originally filed.

The present amendment adds no new matter to the above-captioned application.

A. The Invention

The present invention pertains broadly to a laser machining device such as may be used to drill holes in fluid injection device components, for example, such as are used for injecting fuel into a combustion engine. In accordance with an embodiment of the present invention, a laser machining device is provided that includes features recited by independent claim 12. In accordance with another embodiment of the present invention, a laser machining device is provided that includes features recited by independent claim 29. Various other embodiments of the present invention are recited in the dependent claims.

An advantage provided by the various embodiments of the present invention is that a laser machining device is provided that may be used to drill holes in fluid injection device components, for example, wherein the laser machining device has good operating stability, a high level of hole machining precision, and allows the holes to be machined at a relatively high speed to obtain a high industrial yield.

B. The Rejections

Claims 12-29 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Blakey (U.S. Patent 7,316,067, hereafter the "Blakey Patent") in view of Braiman (U.S. Patent 6,782,016, hereafter the "Braiman Patent") in view of Lantzer (U.S. Patent 4,959,119,

hereafter the "Lantzer Patent"). Claim 13 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent, and further in view of Brown (U.S. Patent 6,331,993, hereafter the "Brown Patent"). Claims 14 and 18 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent, and further in view of Cook (U.S. Patent 6,047,011, hereafter the "Cook Patent"). Claim 15 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent and the Brown Patent, and further in view of the Cook Patent. Claim 16 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent and the Brown Patent, and further in view of Von Allmen et al. (U.S. Patent 4,114,018, hereafter the "Von Allmen Patent"). Claim 17 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent, the Brown Patent and the Cook Patent, and further in view of the Von Allmen Patent. Claims 20 and 21 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent, and in view of the Brown Patent, and further in view of Freitas (U.S. Patent 5,828,683, hereafter the "Freitas Patent"). Claim 22 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent, and further in view of Kuwabara et al. (U.S. Patent 5,381,437, hereafter the "Kuwabara Patent"). Claim 23 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent and the Brown Patent and the Freitas Patent, and further in view of Tatsuno et al. (U.S. Patent 5,377,212, hereafter the "Tatsuno Patent"). Claim 29 stands rejected under 35 U.S.C.

§103(a) as allegedly unpatentable over the Blakey Patent in view of the Braiman Patent in view of the Lantzer Patent and the Freitas Patent, and further in view of the Tatsuno Patent.

Applicants respectfully traverse the Examiner's rejections and request reconsideration of the above-captioned application for the following reasons.

C. Applicants' Arguments

A prima facie case of obviousness requires a showing that the scope and content of the prior art teaches each and every element of the claimed invention, and that the prior art provides some teaching, suggestion or motivation, or other legitimate reason, for combining the references in the manner claimed. KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1739-41 (2007); In re Oetiker, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992). In this case, the Examiner has failed to establish a prima facie case of obviousness against Applicants' claims 12-29 because the combination of the Blakey Patent, the Braiman Patent, the Lantzer Patent, the Von Allmen Patent, the Freitas Patent, the Kuwabara Patent, and the Tatsuno Patent still fails to teach, or suggest, (i) "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range," and (ii) "said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator," as recited by independent claims 12 and 29.

i. The Blakey Patent

The Blakey Patent discloses "forming a perforate membrane by laser drilling and a subsequent electro-polishing step," which pertains to a method of forming a perforate membrane (1) for use in a liquid transport device, wherein the membrane has at least plural nozzles (10) formed therethrough (See Abstract of the Blakey Patent, and Figure 1a).

According to the Blakey Patent, each of the nozzles has a throat portion (12) opening at an opposite end through an opposite surface (2') of the perforate membrane, and a smoothly curved outwardly diverging portion (11) extending from the first end of the throat portion to the first surface (2) of the perforate membrane (See Abstract of the Blakey Patent, and Figure 1b). Laser energy is applied selectively to the first surface (2) of the membrane in the form of a pulsed, focused beam to form the nozzles (10) and thereafter the first surface (2) of the membrane and the surface of the diverging portion (11) of the nozzles (10) are electro-polished to remove surface imperfections (See Abstract of the Blakey Patent). The electro-polishing is controlled so as to remove material from the surface of the diverging portion (11) of the nozzles to a depth less than the length of the throat portion (12), (See Abstract of the Blakey Patent).

As apparently conceded by the Examiner (Office Action, dated September 14, 2009, at 2, line 18, to 3, line 7), the Blakey Patent does not teach, or suggest, (i) "<u>said resonator generates…primary pulses having a length within or greater than the microsecond range</u>" and (ii) "<u>said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator</u>" as recited by independent claims 12 and 29. While the Examiner's assertion that "Blakey describes (Figure 2) laser head 20, external modulator 21, and focus lens 23 used for drilling" (Office Action, dated September 14, 2009, at 2, lines 21-22), may be correct, the laser head disclosed by Blakey is substantially different from the one employed by the presently claimed invention.

Specifically, the Blakey Patent describes, in col. 13, the laser set-up shown in Figure 2, which employs a laser (20) to drill holes in a membrane (1). The laser disclosed by Blakey is able to produce pulses with an energy of 10 mJ in 10 ns (Blakey Patent, col. 13, lines 62-64). This corresponds to a pulse peak power of 1 MW (i.e., $(10 \times 10^{-3}$ J)/(10×10^{-9} s = 1 x

10^6 W), (See Declaration under 37 C.F.R. § 1.132 by V. Romano, hereafter, the "Romano Declaration," ¶ 6). As would be known by a person of ordinary skill in the art, a laser that achieves a pulse peak power of about 1 MW at pulse energies in the mJ level must be a Q-switched laser (Romano Declaration, ¶ 7).

It is a well-settled proposition that a reference may inherently teach subject matter not explicitly disclosed by the reference when the disclosure is sufficient to show that the implicit subject matter is the natural result flowing from the explicitly disclosed subject matter. Continental Can Co. USA Inc. v. Monsanto Co., 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991). Inherency is a question of fact. In re Napier, 34 U.S.P.Q.2d 1782, 1784 (Fed. Cir. 1995). In this case, the Blakey Patent is silent regarding whether the laser (20) contains a Q-switch. However, it is inherent to the disclosure of the Blakey Patent that the laser (20) includes a Q-switch because only a Q-switched laser can achieve a pulse peak power of about 1 MW at pulse energies in the mJ level (Romano Declaration, ¶¶ 5-8 and 15).

Moreover, the duration of the emitted laser pulses, in accordance with the invention of the above-captioned application, are in the range of 1 ms, and correspond to the duration of the pump pulses of the flash lamp (Romano Declaration, ¶ 9). The duration of the emitted laser pulses of the apparatus disclosed by the Blakey Patent is, or course, on the order of 10 ns, which is much shorter than the duration of the pump pulses (Romano Declaration, ¶ 9).

Thus, the Blakey Patent cannot teach, or suggest, "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range" as recited by claims 12 and 29 (Romano Declaration, ¶¶ 9, 10 and 15).

The Blakey Patent discloses the use of a Pockel's cell (21), (Blakey Patent, col. 14, lines 6-17, and Figure 2), but it has a completely different functionality in the apparatus disclosed by the Blakey Patent than the functionality the "modulation means" has in the claimed invention of the present application. More specifically, a Pockels Cell is a device

that contains a photo refractive electro-optic crystal, which can change the polarization or phase of the light beam when a voltage is applied to the crystal (See, e.g., *Pockels Cell*, DiracDelta Science & Engineering Encyclopedia, *at* http://www.diractdelta.co.uk/science/source/p/o/pockels%20cell/sour..., downloaded July 16, 2009, 2 pages, of record). A Pockels Cell acts like a variable wave retarder plate by changing the polarization of the input laser beam when voltage is applied to the Pockels Cell, and, with the addition of a polarizer at the output, then intensity modulation of the light beam may be achieved (See, e.g., *Pockels Cell*, DiracDelta Science & Engineering Encyclopedia, *at* http://www.diractdelta.co.uk/science/source/p/o/pockels%20cell/sour..., downloaded July 16, 2009, 2 pages).

According to the Blakey Patent, the Pockels cell (21) is a modulator used for two purposes. First, it is able to block the laser beam, and to (i) let pass a defined number of pulses onto the work piece (Blakey Patent, col. 13, lines 58-62). The Pockels cell (21) is also switched to open the beam path before the first needed pulse and to block again the beam path after the defined number of pulses, usually 20, has passed (Blakey Patent, col. 13, line 64, col. 14, line 2). Secondly, the Pockels cell (21) is used for (ii) attenuation. The Blakey Patent discloses, at col. 14, lines 9-17, that there is a second parameter set provided with a reduced peak energy of 15 μJ per pulse in 10 ns. Because there is an apparent need to keep the pulse duration constant at 10 ns, this can only be realized by the use of an external modulator, such as the Pockels cell, because decreasing the pump power would result in longer pulse durations as would be understood by those skilled in the art (Romano Declaration, ¶ 12).

On the other hand, the purpose of the "modulation means" recited by independent claims 12 and 29 of the above-captioned application is to cut out parts of the 1 ms pulse. In claim 28, the modulation means, in accordance with a particular non-limiting embodiment of

the present invention, comprises a Pockels cell. Thus, in contrast to the disclosure of the Blakey Patent, the modulation means, such as for example a Pockels cell, of the present invention is switched several times during the laser pulse to generate a pulse train (See, e.g., Specification of the above-captioned application, page 4, lines 1-4 and lines 19-23; and Romano Declaration, ¶ 13). According to the Blakey Patent, however, the pulse train is generated by the laser (20) itself and not by the external Pockels cell modulator (21), (Blakey Patent, col. 13, lines 51-62; and Romano Declaration, ¶ 13).

Thus, the Blakey Patent cannot teach, or suggest, "said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator" as recited by claims 12 and 29 (Romano Declaration, ¶¶ 12-15).

Furthermore, as apparently conceded by the Examiner (Office Action, dated September 14, 2009, at 3, lines 8-22; at 4, lines 1-15; at 5, lines 4-19; at 5, line 20, to 6, line 6; and at 6, line 7, to 7, line 8), the Blakey Patent does not teach, or suggest, (iii) "an optical diode arranged downstream of said resonator" as recited by claims 13, (iv) "means for amplifying the pulses supplied by said resonator" as recited by claim 14, 15 and 18, (v) "said optical diode is formed by a linear polarizer and by a quarter-wave plate arranged following said polarizer" as recited by claims 16 and 17, (vi) "said amplification means include a cavity formed by a second solid state active medium and by second optical pumping means formed by a flash lamp" as recited by claim 20, (vii) "said amplification means include several active mediums defining several amplification levels, each of said active mediums being pumped by a flash lamp" as recited by claim 21, (viii) "said resonator is arranged for supplying at the outlet thereof a linearly polarized laser beam" as recited by claim 22, (ix) "said first active medium is formed by a crystal selected from among crystals that directly generate a linearly polarized light" as recited by claim 23, and (x)

> "means for amplifying the pulses supplied by said resonator, wherein said amplification means are controlled so that amplification pulses are provided with a time lag relative to the primary pulses so that the amplitude of said secondary pulses is modulated, and wherein said amplification means include several active mediums defining several amplification levels, wherein each of said active mediums is pumped by a flash lamp, wherein said first active medium is formed by a $Nd:YVO_4$ crystal that directly generates a linearly polarized light"

as recited by claim 29.

ii. The Braiman Patent

The Braiman Patent discloses a "master laser injection of broad area lasers," which includes systems and methods for laser array synchronization using master laser injection of broad area lasers (See Abstract of the Braiman Patent). According to the Braiman Patent, one method includes: (a) master laser injecting a plurality of broad area lasers, and (b) externally cavity coupling the plurality of broad area lasers (See Abstract of the Braiman Patent). According to the Braiman Patent, another method includes (a) master laser injecting a plurality of broad area lasers, and (b) externally Q switch coupling the plurality of broad area lasers (See Abstract of the Braiman Patent). The Braiman Patent discloses still another method, which includes (a) injection synchronizing a plurality of pulsed broad area lasers using a signal source; (b) modulating the plurality of pulsed broad area lasers using the signal source, and (c) externally coupling the plurality of pulsed broad area lasers (See Abstract of the Braiman Patent).

The Braiman Patent discloses using a Q switching pulse master laser (See, e.g., claims 12, 24, 34, and col. 6, lines 24-42). Thus, the Braiman Patent does not teach, or suggest, (i) "said resonator generates, <u>without a Q switch</u>, primary pulses having a length within or greater than the microsecond range" as recited by claims 12 and 29.

The Examiner erroneously contends Braiman discloses "a pumped Nd:YAG laser resonator with external modulator 450 and focus lens 460" (Office Action, dated September

14, 2009, at 2, lines 23-24). As would be instantly realized by a person of ordinary skill in the art, the phase controllers (450) disclosed by the Braiman Patent may control phase (Braiman Patent, col. 6, lines 38-42, and Figures 4A and 4B); however, they do not constitute "modulation means" in accordance with the presently claimed invention because they do not (ii) "receive[] primary pulses from said resonator and operate[] to output a train of secondary pulses for each primary pulse entering therein from said resonator" wherein "each secondary pulse has a shorter length than the corresponding primary pulse" as recited by claims 12 and 29. The modulation means, in accordance with the present invention, receives primary pulses from the resonator and outputs a train of secondary pulses that each have a shorter length than the corresponding primary pulse. The phase controllers (450) may modulate phase, but they do not modulate the amplitude of the secondary pulses.

As apparently conceded by the Examiner (Office Action, dated September 14, 2009, at 3, lines 8-22; at 4, lines 1-15; at 5, lines 4-19; at 5, line 20, to 6, line 6; and at 6, line 7, to 7, line 8), the Braiman Patent does not teach, or even suggest, (iii) "an optical diode arranged downstream of said resonator" as recited by claims 13, (iv) "means for amplifying the pulses supplied by said resonator" as recited by claim 14, 15 and 18, (v) "said optical diode is formed by a linear polarizer and by a quarter-wave plate arranged following said polarizer" as recited by claims 16 and 17, (vi) "said amplification means include a cavity formed by a second solid state active medium and by second optical pumping means formed by a flash lamp" as recited by claim 20, (vii) "said amplification means include several active mediums defining several amplification levels, each of said active mediums being pumped by a flash lamp" as recited by claim 21, (viii) "said resonator is arranged for supplying at the outlet thereof a linearly polarized laser beam" as recited by claim 22, (ix) "said first active medium is formed by a crystal selected from among crystals that directly generate a linearly polarized light" as recited by claim 23, and (x)

> "means for amplifying the pulses supplied by said resonator, wherein said amplification means are controlled so that amplification pulses are provided with a time lag relative to the primary pulses so that the amplitude of said secondary pulses is modulated, and wherein said amplification means include several active mediums defining several amplification levels, wherein each of said active mediums is pumped by a flash lamp, wherein said first active medium is formed by a Nd:YVO_4 crystal that directly generates a linearly polarized light"

as recited by claim 29.

iii. <u>The Lantzer Patent</u>

The Lantzer Patent discloses a "method for forming through holes in a polyimide substrate," which pertains to hole formation in a polyimide substrate using a carbon dioxide laser (See Abstract of the Lantzer Patent). The Lantzer Patent discloses a carbon dioxide laser operated in a pulse mode and generating a laser beam modulated in pulses in which the pulse length ranges between 0.1 to 0.4 milliseconds and the frequency of the pulses range between 800 to 1200 (Lantzer Patent, col. 3, lines 39-59). The Lantzer Patent further discloses the fact that "[h]igher frequencies result in shortening the pulse length into a less desirable operating window for the laser" (Lantzer Patent, col. 3, lines 57-59).

In view of the above, a person of ordinary skill in the art would appreciate that higher frequencies result in shortening of the pulse length. Thus, if the laser head is controlled with a higher frequency, the pulses delivered by the laser resonator will have a smaller length. This teaching does not suggest that the laser resonator provides primary pulses in the microsecond range or higher, and it does not suggest doing so without a Q switch. Therefore, the Lantzer Patent does not teach, or suggest, (i) "said resonator generates, <u>without a Q switch</u>, primary pulses having a length within or greater than the microsecond range" as recited by claims 12 and 29.

In addition, the Lantzer Patent does not teach, or suggest, implementing an external modulation means to modulate each primary pulse to form a train of secondary pulses for

each corresponding primary pulse. Therefore, the Lantzer Patent also does not teach, or suggest, (ii) "said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator" as recited by independent claims 12 and 29.

As apparently conceded by the Examiner (Office Action, dated September 14, 2009, at 3, lines 8-22; at 4, lines 1-15; at 5, lines 4-19; at 5, line 20, to 6, line 6; and at 6, line 7, to 7, line 8), the Lantzer Patent does not teach, or even suggest, (iii) "an optical diode arranged downstream of said resonator" as recited by claims 13, (iv) "means for amplifying the pulses supplied by said resonator" as recited by claim 14, 15 and 18, (v) "said optical diode is formed by a linear polarizer and by a quarter-wave plate arranged following said polarizer" as recited by claims 16 and 17, (vi) "said amplification means include a cavity formed by a second solid state active medium and by second optical pumping means formed by a flash lamp" as recited by claim 20, (vii) "said amplification means include several active mediums defining several amplification levels, each of said active mediums being pumped by a flash lamp" as recited by claim 21, (viii) "said resonator is arranged for supplying at the outlet thereof a linearly polarized laser beam" as recited by claim 22, (ix) "said first active medium is formed by a crystal selected from among crystals that directly generate a linearly polarized light" as recited by claim 23, and (x)

> "means for amplifying the pulses supplied by said resonator, wherein said amplification means are controlled so that amplification pulses are provided with a time lag relative to the primary pulses so that the amplitude of said secondary pulses is modulated, and wherein said amplification means include several active mediums defining several amplification levels, wherein each of said active mediums is pumped by a flash lamp, wherein said first active medium is formed by a Nd:YVO_4 crystal that directly generates a linearly polarized light"

as recited by claim 29.

iv. The Von Allmen Patent

The Von Allmen Patent discloses a "method for ablating metal workpieces with laser radiation," which pertains to a technique for ablating a metal workpiece by the use of laser beam radiation at an efficiency higher than previously possible and an improved regulation of the ablation process (See Abstract of the Von Allmen Patent). The Von Allmen Patent discloses eliminating undesired side effects of the ablation process by the entire and complete ejection of the molten metal at the point of beam impingement so that no material remains on the workpiece in the areas between contiguous points of ablation (See Abstract of the Von Allmen Patent). The Von Allmen Patent also discloses the appropriate selection of beam intensity and the selection of pulse shape in accordance with the disclosed method (See Abstract of the Von Allmen Patent). The Von Allmen Patent discloses a lasing system in Figure 6, which includes an optical diode (18) that may include an additional polarizer and a quarter-wave plate (Von Allmen Patent, col. 6, lines 8-10 and lines 54-58).

v. The Freitas Patent

The Freitas Patent discloses a "high density, optically corrected, micro-channel cooled, V-groove monolithic laser diode array," that achieves stacking pitches to 33 bars/cm by mounting laser diodes into V-shaped grooves, and that this disclosed design delivers >4kW/cm^2 of directional pulsed laser power (See Abstract of the Freitas Patent). The Freitas Patent discloses that the optically corrected, micro-channel cooled, high density laser is usable in all solid state laser systems that require directional, narrow bandwidth, high optical power density pump sources (See Abstract of the Freitas Patent). The Freitas Patent discloses the use of laser diode arrays to optically excite, or "pump," a crystal host and offer a narrow band of emission, compactness, high electrical efficiency, and higher reliability compared to flash lamps (Freitas Patent, col. 1, lines 17-29).

vi. The Kuwabara Patent

The Kuwabara Patent discloses a "high-power solid-state laser resonator," which is allegedly capable of outputting a high power linearly polarized laser beam, in which a laser beam subjected to the birefringence in the laser resonator is effected to minimize a component of the laser beam that is orthogonal with the direction of polarization definable by a Brewster plate upon traversing a quarter-wave plate, which enables the linear polarization output distribution of the laser beam to become uniform (See Abstract of the Kuwabara Patent).

vii. The Tatsuno Patent

The Tatsuno Patent discloses a "solid-state laser device including uniaxial laser crystal emitting linearly polarized fundamental wave and nonlinear optical crystal emitting linearly polarized harmonic wave," which pertains to a short-wavelength laser having a stable output and an optical information processing system capable of high-density recording, wherein the solid-state laser is used as a light source, and a nonlinear optical crystal is arranged in a resonator in order to produce a short wavelength by means of a solid-state laser (See Abstract of the Tatsuno Patent). The Tatsuno Patent discloses that retardation of the nonlinear optical crystal is controlled by determining the length of the nonlinear optical crystal, and that the solid-state laser device has a stable output with the noise removed from a pumping power light source (See Abstract of the Tatsuno Patent). The Tatsuno Patent further discloses that the solid-state laser device is used as a light source for an optical information processing system, and the light of irrelevant wavelengths contained in the light from the solid-state laser device are removed by a device having the ability to select wavelengths; thus, not only a stable light source with a short wavelength but also an optical information

processing system capable of high-density recording are realized (See Abstract of the Tatsuno Patent). The Tatsuno Patent also discloses a linearly polarized Nd:YVO solid laser 1064 nm in wavelength and that if a KTP crystal is placed in a resonator of the Nd:YVO solid laser, then the retardation would disturb the linear polarization of the Nd:YVO solid laser into elliptic polarization (Tatsuno Patent, col. 5, lines 38-50).

viii. Summary of the Disclosures

The combination of the Blakey Patent, the Braiman Patent, the Lantzer Patent, the Von Allmen Patent, the Freitas Patent, the Kuwabara Patent, and the Tatsuno Patent still fails to teach, or suggest, (i) "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range," and (ii) "said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator," as recited by independent claims 12 and 29.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 12-29 of the above-captioned application.

ix. No Legitimate Reason to Justify the Combination of Disclosures and No Reasonable Expectation of Success of Obtaining Applicants' Claimed Invention Even if the Proposed Combination was Made

A proper rejection under Section 103 requires showing (1) that a person of ordinary skill in the art would have had a legitimate reason to attempt to make the composition or device, or to carry out the claimed process, and (2) that the person of ordinary skill in the art would have had a reasonable expectation of success in doing so. PharmaStem Therapeutics, Inc. v. ViaCell, Inc., 491 F.3d 1342, 1360 (Fed. Cir. 2007). In this case, the Examiner has

failed to establish a prima facie case of obviousness against Applicants' claimed invention because the Examiner has not demonstrated a legitimate reason to make the proposed combination of disclosures and because the Examiner has failed to demonstrate that a person of ordinary skill in the art would have had a reasonable expectation of success even if the combination proposed by the Examiner was made.

Specifically, the Examiner's proposed combination of the Blakey Patent, the Braiman Patent, the Lantzer Patent, the Von Allmen Patent, the Freitas Patent, the Kuwabara Patent, and the Tatsuno Patent falls way short of disclosing each and every limitation recited by claims 12-29 for all of the reasons discussed above. Therefore, it is clear that the Examiner is impermissibly using the claimed invention as the instruction manual or template to piece together isolated teachings of the prior art to deprecate the claimed invention. In re Fritch, 23 U.S.P.Q.2d 1780. 1784 (Fed. Cir. 1992). This fact is even more clear with respect to the subject matter of independent claim 29, which the Examiner contends is "obvious" in view of no less than five (5) isolated patent disclosures (See Office Action, dated September 14, 2009, at 6, line 7, to 7, line 8), even though the combination of the five isolated disclosures falls way short of the subject matter of claim 29. Likewise, the Examiner has employed five disclosures when alleging obviousness of claims 15, 16, 20, 21 and 23, which are other impermissible and imperfect combinations of disconnected disclosures. With respect to claim 17, the Examiner has employed at least six disconnected disclosures in an imperfect attempt to recreate a facsimile of the invention.

It is also noted that the Braiman Patent discloses using a laser that includes Q-switching technology, so the combination of the disclosures of the Blakey Patent and the Braiman Patent would employ a laser that contains a Q-switch. The Lantzer Patent does not disclose a laser that generates primary pulses without a Q-switch; therefore, the combination

of the Blakey Patent, the Braiman Patent and the Lantzer Patent would employ a laser that includes a Q-switch.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 15, 16, 17, 20, 21, 23 and 29 because the Examiner has established no legitimate reason for piecing together so many disconnected disclosures.

In addition, the Federal Circuit has ruled that a prima facie case of obviousness cannot be established based on a modification of prior art that would obliterate an essential feature of the prior art device. McGinley v. Franklin Sports Inc., 60 U.S.P.Q.2d 1001, 1010-11 (Fed Cir. 2001). In this case, the Blakey Patent discloses a laser apparatus that inherently employs a Q-switch because only a Q-switched laser can achieve a pulse peak power of about 1 MW at pulse energies in the mJ level (Romano Declaration, ¶¶ 5-8 and 15). Claims 12 and 29 of the present invention recite that "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range." Because the Q switch is an essential feature of the laser apparatus disclosed by the Blakey Patent, thereby allowing it to achieve pulse peak power of about 1 MW, there is no legitimate reason to modify the device disclosed by the Blakey Patent so as to remove the Q switch.

In other words, the "laser machining device" of the present invention is a pulsed laser and not a Q-switch laser as clearly described in Applicants' original specification, at 1, lines 7-11, and at 1, line 27, to 2, line 8, and at 2, line 30, to 3, line 7. The laser pulses are generated, according to the present invention, by controlling the pump means in a pulsed mode. To the contrary, the Blakey Patent describes a Q-switch laser head provided with an external modulator that acts as a switch to stop the pulses generated by the laser head and to allow a given number of pulses to pass through for drilling a specific hole (Blakey Patent, col. 13, line 58, to col. 14, line 2). The Blakey Patent does not teach, or suggest, using an external modulator to modulate each primary pulse generated by the laser resonator so as to

output a secondary pulse train wherein each secondary pulse has a shorter length than the corresponding primary pulse.

Furthermore, a person of ordinary skill in the art would have no reasonable expectation of success of arriving at a "laser machining device" as claimed that has the features wherein (i) the "resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range," (ii) "modulation means arranged between said resonator and a machining head, wherein said modulation means receives primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator," and (iii) "each secondary pulse has a shorter length than the corresponding primary pulse" as recited by independent claims 12 and 29, even if the combination of disclosures asserted by the Examiner was made. The device of claims 12 and 29, of the above-captioned application, is characterized by a laser resonator arranged for generating primary pulses, without a Q switch, having a length within or greater than the microsecond range. Thus, the laser resonator provides primary pulses with a time length relatively long and having enough energy for drilling a hole in fluid injection devices. Accordingly, the laser resonator of the present invention is not equipped with a Q-switch, which typically generates pulses in the nanometer range, in order to generate with standard laser equipment primary pulses within or greater than the microsecond range.

Furthermore, the laser machining device of claim 12 and of claim 29 includes modulation means arranged between the resonator and machining head, i.e. modulation means arranged downstream of the laser resonator. This modulation means modulates the incoming laser beam (i.e. the primary pulses) so as to vary the power profile of each primary pulse such that secondary pulse trains of shorter length than the primary pulses are formed. The resulting pulse trains improve the efficiency and precision of the machining device in a manner which has not been disclosed and is not obvious in view of the Examiner's cited art.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 12-29 of the above-captioned application.

x. Miscellaneous Comments

With respect to claims 12 and 29, the Examiner states that "method limitations may not positively further limit apparatus claims" (Office Action, dated September 14, 2009, at 3, lines 6-7, and at 6, lines 20-21). Applicants object to this assertion made by the Examiner because the Examiner fails to identify any "method limitations" in the claims that allegedly fail to positively further limit the apparatus claims. Applicants contend that there are no "method limitations" in the claims of the above-captioned application. Applicants further contend that any functional limitations in the claims should be given patentable weight, In re Swinehart, 169 U.S.P.Q. 226, 228-29 (C.C.P.A. 1971). To the extent that the Examiner has failed to consider all of the limitations recited in Applicants' claims in favor of examining the "gist" of the invention, Applicants remind the Examiner that the invention is defined by the claims. Vas-Cath Inc. v. Mahurkar, 19 U.S.P.Q.2d 1111, 1118 (Fed. Cir. 1991).

Therefore, Applicants contend that any limitations not properly considered by the Examiner represents a clear error rendering the Examiner's obviousness rejections untenable.

III. CONCLUSION

The Examiner has failed to establish prima facie case of obviousness against claims 12-29 because the combination of the Blakey Patent, the Braiman Patent, the Lantzer Patent, the Von Allmen Patent, the Freitas Patent, the Kuwabara Patent, and the Tatsuno Patent fails to teach, or suggest, (i) "said resonator generates, without a Q switch, primary pulses having a length within or greater than the microsecond range," (ii) "modulation means arranged between said resonator and a machining head, wherein said modulation means receives

primary pulses from said resonator and operates to output a train of secondary pulses for each primary pulse entering therein from said resonator," and (iii) "each secondary pulse has a shorter length than the corresponding primary pulse" as recited by independent claims 12 and 29.

For all of the above reasons, claims 12-29 are in condition for allowance and a prompt notice of allowance is earnestly solicited.

The below-signed attorney for Applicants welcomes any questions.

Respectfully submitted,

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